

**Translation**

**PATENT COOPERATION TREATY**  
**PCT**

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
 (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>JST-112-PCT</b>	<b>FOR FURTHER ACTION</b> See Form PCT/IPEA/416	
International application No. <b>PCT/JP2004/004210</b>	International filing date (day/month/year) <b>25.03.2004</b>	Priority date (day/month/year) <b>23.06.2003</b>
International Patent Classification (IPC) or national classification and IPC		
Applicant <b>JAPAN SCIENCE AND TECHNOLOGY AGENCY</b>		

<ol style="list-style-type: none"> <li>This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</li> <li>This REPORT consists of a total of <u>7</u> sheets, including this cover sheet.</li> <li>This report is also accompanied by ANNEXES, comprising:                     <ol style="list-style-type: none"> <li><input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <u>4</u> sheets, as follows:                             <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> </li> <li><input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</li> </ol> </li> <li>This report contains indications relating to the following items:                     <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the report</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul> </li> </ol>
---

Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/JP	Authorized officer
Facsimile No.	Telephone No.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/JP2004/004210

## Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- This report is based on translations from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of:
- international search (Rule 12.3 and 23.1(b))
  - publication of the international application (Rule 12.4)
  - international preliminary examination (Rule 55.2 and/or 55.3)
2. With regard to the elements of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):
- the international application as originally filed/furnished  
 the description:  
 pages 1-5, 7-10 as originally filed/furnished  
 pages\* 6 received by this Authority on 15.09.2005  
 pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_  
 the claims:  
 nos. 2, 6-8 as originally filed/furnished  
 nos.\* \_\_\_\_\_ as amended (together with any statement) under Article 19  
 nos.\* 1, 3-5 received by this Authority on 15.09.2005  
 nos.\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_  
 the drawings:  
 sheets fig. 2-13 as originally filed/furnished  
 sheets\* fig. 1 received by this Authority on 15.09.2005  
 sheets\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_  
 a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.
3.  The amendments have resulted in the cancellation of:
- the description, pages \_\_\_\_\_
  - the claims, nos. \_\_\_\_\_
  - the drawings, sheets/figs \_\_\_\_\_
  - the sequence listing (specify): \_\_\_\_\_
  - any table(s) related to sequence listing (specify): \_\_\_\_\_
4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- the description, pages \_\_\_\_\_
  - the claims, nos. \_\_\_\_\_
  - the drawings, sheets/figs \_\_\_\_\_
  - the sequence listing (specify): \_\_\_\_\_
  - any table(s) related to sequence listing (specify): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/JP2004/004210

**Box No. V** **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Claims	1 - 8	YES
	Claims		NO
Inventive step (IS)	Claims	6 - 8	YES
	Claims	1 - 5	NO
Industrial applicability (IA)	Claims	1 - 8	YES
	Claims		NO

**2. Citations and explanations (Rule 70.7)****(1) Novelty and Inventive Step**

Document 1: M.S. GUSMÃO and G.D. MAHAN, Journal of Applied Physics, Vol. 79, No. 5, 01 May 1996, pages 2752 to 2754

Document 2: JP 5-343661 A (Ricoh Co., Ltd.), 24 December 1993, paragraphs [0001] to [0005], [0019] to [0020] and [0036], and fig. 1

Document 3: JP 7-58324 A (Xerox Corp.), 03 March 1995, paragraphs [0017] to [0018], and fig. 17 & EP 634795 A2 & US 5321293 A

Document 4: JP 9-237887 A (Hitachi, Ltd.), 09 September 1997, paragraphs [0002] to [0006], and fig. 15 to 17

Document 5: JP 2001-7323 A (Sanyo Electric Co., Ltd.), 12 January 2001, paragraph [0023] and fig. 3

Claims 1 and 3 to 4

The inventions set forth in claims 1 and 3 to 4 are novel in relation to the documents that are cited in the international search report; however, said inventions do not involve an inventive step in the light of documents 1 to 3 or documents 1 to 2 and 4.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/JP2004/004210

Box No. V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Document 1 indicates that:

- it is possible to control the depth of the band gap of the sub-band that is caused by the linear potential in the channel of a p-type MOSFET (section II, sentence 1);
- it is possible to detect the photon energy (i.e. the wavelength) that corresponds to the aforementioned band gap; and
- it is possible to set the wavelength to be detected by tuning the gate voltage,

and it would have been apparent to a person skilled in the art that an n<sup>+</sup> diffusion layer is disposed below the drain electrode or the source electrode within the p-type MOSFET (for example, refer to documents 3 to 4).

In general, it is obvious that changing the gate voltage in the MOSFET will cause a corresponding change in the channel width (corresponding to the "depth from the surface of said first diffusion layer at which the electrons are captured" in the present application).

With regards to the feature in question, the applicant asserts that unlike the present application, document 1 does not mention the aforementioned relationship between the channel widths and the wavelengths. However, claims 1 and 3 to 4 merely disclose the feature of "measuring the wavelength and the strength of the incident light by changing the depth...at which the electrons are captured and then measuring the electrical current, which is indicative of the amount of electrons,"

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**International application No.  
PCT/JP2004/004210**Box No. V      Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

and thus do not make any specific disclosures in relation to the relationship between the depths (the gate voltages) and the wavelengths. Therefore, the abovementioned assertion is not based upon the disclosures in the claims.

In addition, document 1 does not clearly disclose the technical means by which the gate electrode transmits the incident light. However, document 2 discloses the feature of employing electrodes that are transparent in relation to the incident light so that it is possible to detect the incident light in the semiconductor region below the electrode, and it is necessary for the light to reach the channel region below the gate electrode in the invention that is disclosed in document 1; therefore, it would have been easy for a person skilled in the art to conceive of employing the transparent electrode that is disclosed in document 2 in the invention that is disclosed in document 1.

**Claim 2**

The invention set forth in claim 2 is novel in relation to the documents that are cited in the international search report; however, said claim does not involve an inventive step in the light of documents 1 to 3 or documents 1 to 2 and 4.

Only a limited range of wavelengths can be detected using a single gate voltage in the invention disclosed in document 1; therefore, a person skilled in the art could have set the tuning frequency for the gate voltage according to the wavelength band of the incident light, as necessary.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/JP2004/004210

Box No. V      **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement**

## Claim 5

The invention set forth in claim 5 is novel in relation to the documents that are cited in the international search report; however, said claim does not involve an inventive step in the light of documents 1 to 3 and 5 or documents 1 to 2 and 4 to 5.

The feature of configuring the gate electrode of a MOSFET from a doped polysilicon material was well known prior to the filing of the present application, as disclosed in document 5. Therefore, it would have been easy for a person skilled in the art to conceive of simply employing the abovementioned well-known configuration as the specific configuration of the gate electrode in the MOSFET from the invention that is disclosed in document 1.

## Claims 6 to 8

The invention set forth in claims 6 to 8 involves an inventive step in relation to the documents that are cited in the international search report.

Document 1 does not indicate whether it is possible to detect the wavelengths of red light, green light and blue light, and the invention that is disclosed in document 1 is only intended to detect far infrared light with a wavelength of approximately 10 to 60 meV; furthermore, the documents that are cited in the international search report do not disclose or suggest configurations for detecting visible light, which has a completely different energy band from infrared light, by means of a similar measurement principle. Therefore, it would not have been easy to conceive of attempting to do so, even for a person skilled in the art.

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

International application No.

PCT/JP2004/004210

Box No. V	<b>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</b>
-----------	--

**(2) Industrial Applicability**

It is apparent that the inventions set forth in claims 1 to 8 exhibit industrial applicability.